

REMARKS

Upon entry of the amendments in this paper, claims 2 and 6-8 will be pending in the above identified application. Claims 2 is herein amended. Claims 1 and 3-5 are herein canceled. Claims 6-8 are herein added. It is respectfully submitted that this paper is fully responsive to the Office action mailed on July 21, 2010.

Specification

The abstract stands objected to for being too long. Applicants have amended the abstract to be 150 words or less. Applicants respectfully submit that the abstract is in proper form and ask that the objection be withdrawn.

On the Merits

Claim Rejections - 35 U.S.C. § 102(b)

Claims 1, 2 and 4 were rejected under 35 U.S.C. § 102(b) as being anticipated by *Anderson* (US Patent 3,143,867).

Independent Claim 6:

Independent claim 6 recites:

A ball spline comprising:
a spline shaft having a substantially circular sectional configuration, and having in the outer peripheral surface thereof a plurality of lines of longitudinally extending arcuate torque transmission grooves arranged at equal intervals, with the ball rolling faces being formed on side surfaces of land parts situated in between the torque transmission grooves, such that the ball rolling faces are on both sides in the width direction of each torque transmission groove; and

a spline nut formed substantially as a cylinder with a hollow hole into which the spline shaft is fitted, having on an inner peripheral surface of the hollow hole a plurality of lines of load rolling faces which are adjacent in the circumferential direction opposed to the ball rolling faces of the spline shaft;

a large number of balls rolling while receiving a load in the load region formed whereby the ball rolling faces of the spline shaft and the load rolling faces of the spline nut are opposed to each other; and

the distance between a pair of rows of balls rolling on the ball rolling faces situated on both sides of each of the land parts is set larger than the distance between a pair of rows of balls rolling on the ball rolling faces on both sides of each of the torque transmission grooves.

New independent claim 6 is different from *Anderson* in terms of the composition of an endless circulation path.

In the disclosure of *Anderson*, the sleeve sections 15 and 16 are adjacent to each other in an axial direction of the spline shaft. In the sleeve section 16, the balls receive only counterclockwise torque acting on the sleeve section 16. In the sleeve section 15, the balls receive only clockwise torque acting on the sleeve section 15. (Please see FIG. 4 of *Anderson*, shown below.)

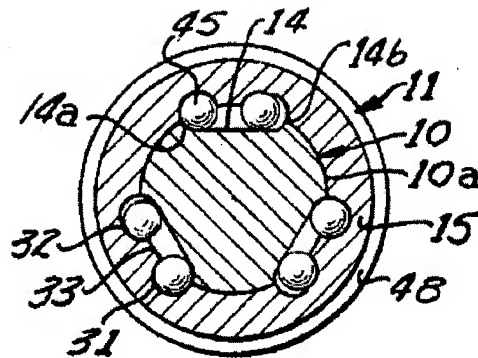


Fig. 4.

That is, in the disclosure of *Anderson*, the rows of balls which receive counterclockwise torque are separate from the rows of balls which receive clockwise torque in an axial direction of the spline shaft.

On the other hand, in the attached new claim 6, of the balls rolling on the pair of ball rolling faces formed on both sides of each torque transmission groove of the spline shaft, the balls rolling on a ball rolling face receive counterclockwise torque acting on the spline nut, and the balls rolling on the other ball rolling face receive clockwise torque. (Please see paragraph [0029] of page 14 in specification, for example.)

Thus, the attached new claim 6 is different from *Anderson* in term of the composition of an endless circulation path. Consequently, the attached new claim 6 is not disclosed or rendered obvious over the disclosure of *Anderson*.

Claim Rejections - 35 U.S.C. § 103(a)

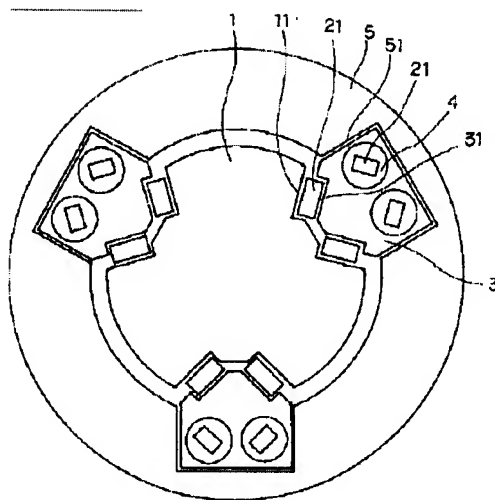
Claims 1-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Komata* (JP 06-241228).

In the attached new claim 6, the spline shaft has a substantially circular sectional configuration, and has in the outer peripheral surface thereof the torque transmission grooves formed in an arcuate shape.

Therefore, when producing the spline shaft by drawing, it is possible to reduce the sectional area reduction ratio of the shaft material as a result of the drawing, thereby making it possible to enhance the machining efficiency in the drawing (please see paragraph [0012] of page 6 in specification, for example).

It is possible to set the sectional area larger than that of a spline shaft of a substantially square sectional configuration, so that it is possible to make the geometrical moment of inertia of the spline shaft much larger, thereby making it possible to enhance the flexural rigidity of the spline shaft (please see paragraph [0025] of page 11-12 in specification, for example).

On the other hand, in the invention of *Komata*, the roller rolling faces are formed substantially perpendicular to the outer peripheral surface of the spline shaft. Therefore, the sectional configuration of the spline shaft is complicated. Please see FIG. 2 of *Komata*, shown below.



When the spline shaft of *Komata* is formed by drawing, so that the sectional area reduction ratio of the shaft material as a result of the drawing is rather large, resulting in a rather poor machining efficiency (paragraph 5 of page 3 in specification).

Furthermore, as compared with the spline shaft of the attached new claim 6, in the case of the spline shaft of *Komata*, the sectional area cannot help but be small if the maximum diameter is the same, and the geometrical moment of inertia is much smaller, which is disadvantageous as

far as the flexural rigidity of the spline shaft is concerned (paragraph 8 of page 4-5 in specification).

Thus, new claim 6 is different from *Komata* in term of the composition of the spline shaft. Therefore, the attached new claim 6 has a working-effect that the invention of *Komata* does not have. Consequently, applicants respectfully submit that the features of claim 6 are not disclosed or rendered obvious to a person having ordinary skill in the art.

Claim 5 stands rejection under 35 U.S.C. § 103(a) as being unpatentable over either *Anderson* or *Komata* as applied to claim 1 and further in view of *Honma* (JP 10-196652).

Claim 5 is herein canceled, thus rendering the rejection moot.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Application No. 10/583,411
Art Unit: 3656

Amendment under 37 C.F.R. §1.111
Attorney Docket No. 062654

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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